

Time: 4 minutes: Closed book, closed notes, no calculator allowed

1. What is the value of $G'(6)$ if

$$G(x) = \int_1^{x/2} \frac{1}{t^2 + 1} dt \quad ?$$

CIRCLE ONE AND PUT YOUR WORK BELOW

- (a) $1/37$
(b) $1/20$
(c) $1/17$
(d) $1/10$
(e) $1/5$
2. Let $f(x)$ be a continuous function on the interval $[a, b]$.

Complete the statements of the two parts of the Fundamental Theorem of Calculus.

(I) If $g(x) = \int_a^x f(t) dt$, then $g'(x) = f(x)$

(II) If $F(x)$ is an antiderivative of $f(x)$, then $\int_a^b f(x) dx = F(b) - F(a)$.

By the Fundamental Theorem of Calculus and the Chain Rule

$$G'(x) = \frac{1}{\left(\frac{x}{2}\right)^2 + 1} \cdot \frac{d}{dx} \left(\frac{x}{2}\right) = \frac{1}{\left(\frac{x}{2}\right)^2 + 1} \cdot \frac{1}{2}$$

So

$$G'(6) = \frac{1}{3^2 + 1} \cdot \frac{1}{2} = \frac{1}{20}$$